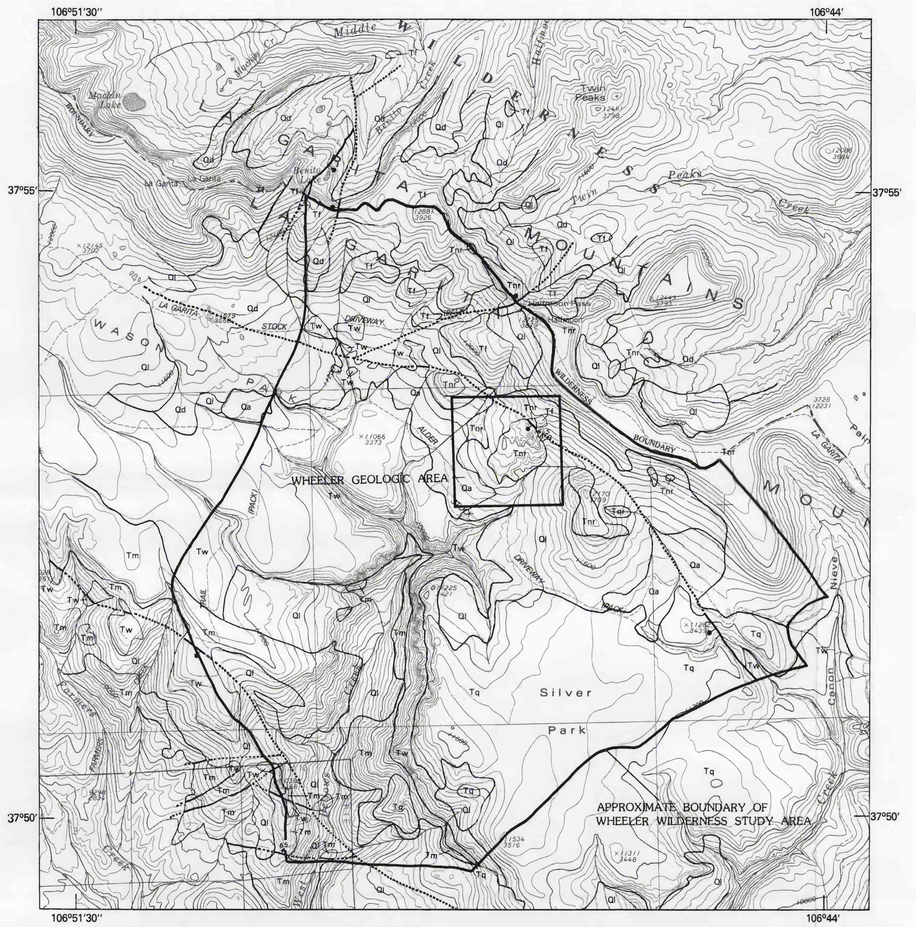
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1571
PAMPHLET ACCOMPANIES MAP



Base from U.S. Geological Survey
County Map Series, 1978

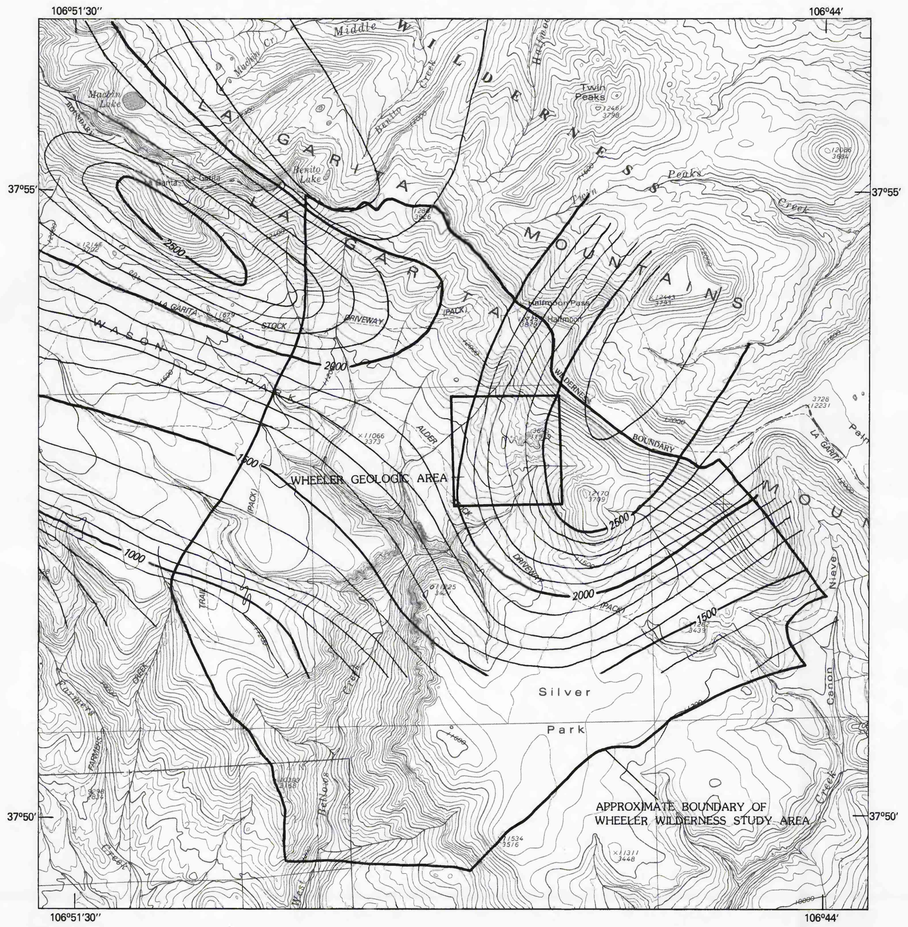
Geology by T. A. Steven and J. C. Ratté, 1961-1971; from Steven and Bieniewski (1977) and from Steven and Ratté (1973)

SCALE 1:50 000

1 ½ 0 1 2 3 MILES

1 .5 0 1 2 3 KILOMETERS

MAP A—GEOLOGIC MAP OF THE WHEELER WILDERNESS STUDY AREA



Base from U.S. Geological Survey
County Map Series, 1978

Aeromagnetic survey flown in 1968 at 14,500 ft barometric elevation; flight-line spacing 1 mi

SCALE 1:50 000

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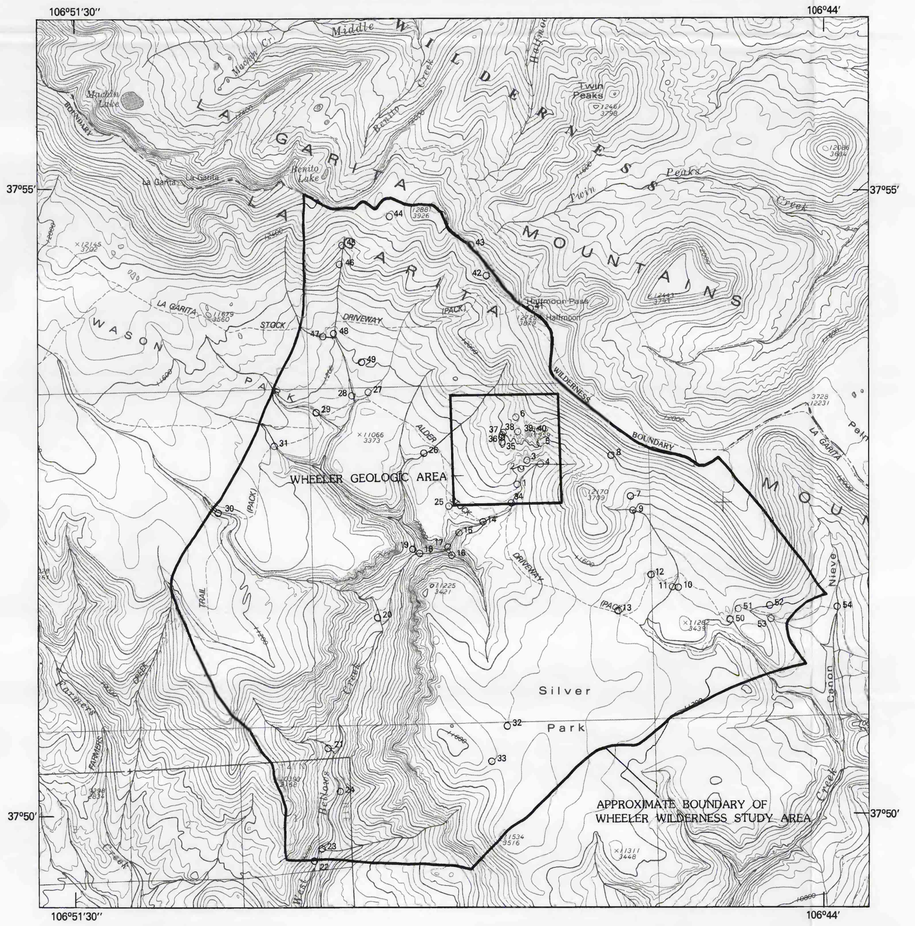
MAP B—AEROMAGNETIC MAP OF THE WHEELER WILDERNESS STUDY AREA



Base from U.S. Geological Survey
County Map Series, 1978

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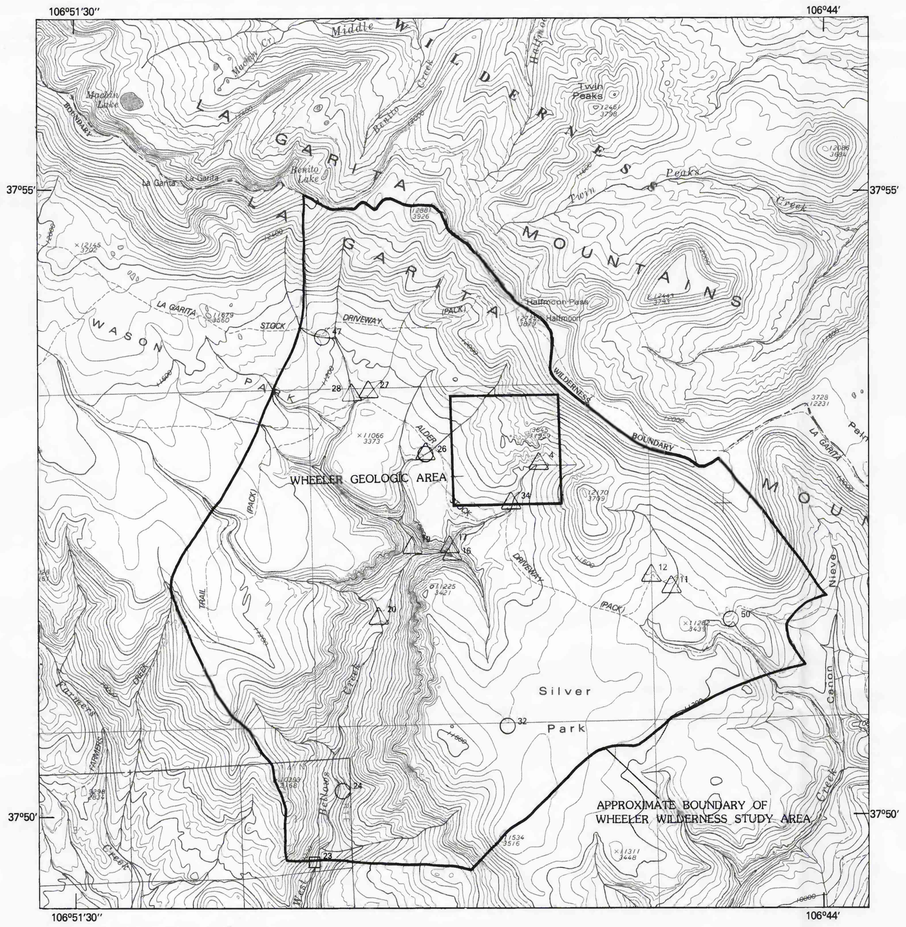
MAP C—MAP SHOWING SAMPLE LOCALITIES, WHEELER WILDERNESS STUDY AREA



Base from U.S. Geological Survey
County Map Series, 1978

SCALE 1:50 000

1 ½ 0 1 2 3 MILES

1 .5 0 1 2 3 KILOMETERS

MAP D—MAP SHOWING LOCALITIES OF CHEMICALLY ANOMALOUS SAMPLES, WHEELER WILDERNESS STUDY AREA

CORRELATION OF MAP UNITS

Qa	Ql	Qd	QUATERNARY
	Tnr	Tq	TERTIARY
	Tw		Oligocene
	Tm		
	Tf		

LIST OF MAP UNITS

Qa ALLUVIUM AND TERRACE GRAVELS (QUATERNARY)

Ql LANDSLIDE DEBRIS (QUATERNARY)

Qd GLACIAL DRIFT (QUATERNARY)

Tnr NELSON MOUNTAIN TUFF AND RAT CREEK TUFF, UNDIVIDED (OLIGOCENE)

Tq QUARTZ LATITE AND RHYOLITE BRECCIAS (OLIGOCENE)

Tw WASON PARK TUFF (OLIGOCENE)

Tm MAMMOTH MOUNTAIN TUFF (OLIGOCENE)

Tf FISH CANYON TUFF (OLIGOCENE)

CONTACT

FAULT--Bar and ball on downthrown side. Dashed where inferred; dotted where concealed

2000 MAGNETIC CONTOURS--Showing total-intensity magnetic field of the Earth in gammas, relative to arbitrary datum. Contour interval 100 gammas

o24 SAMPLE LOCALITY AND NUMBER

LOCALITIES OF ANOMALOUS SAMPLES--All analyses by semiquantitative spectrographic method (ICP); sample locality numbers appear beside each symbol

□22 Gold--In amount of 4 parts per million (ppm)

○32 Uranium--In amounts of 40-50 ppm

△12 Zinc--In amounts of 110-510 ppm

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Wheeler Wilderness Study Area in the Rio Grande National Forest, Mineral County, Colo.

MINERAL RESOURCE POTENTIAL
SUMMARY STATEMENT

There are no indications of significant mineral deposits within the Wheeler Wilderness Study Area, and no mining claims or permits are known to have existed within it. Low-level anomalous concentrations of gold, uranium, and zinc were found in a few stream-sediment samples and panned concentrates, but the occurrences are randomly distributed, and there is little likelihood that they are related to concealed mineral deposits. A zeolite mineral (phillipsite?), which occurs in very small amounts in altered tuff, does not represent a resource commodity.

The study area is underlain entirely by volcanic rocks of Oligocene age, which have been interpreted to be within a huge volcanic subsidence structure about 25 mi in diameter, La Garita caldera (see fig. 2, this report; Steven and Lipman, 1976; Steven and Bieniewski, 1977). The possibility of intrusive rocks beneath parts of the study area is indicated by two magnetic highs (map B) that extend into the adjoining La Garita Wilderness (U.S. Geological Survey, 1972). Despite these somewhat favorable aspects of geology and structure, the study area has a low potential for the occurrence of metallic mineral deposits or other mineral commodities.

INTRODUCTION

The Wheeler Wilderness Study Area adjoins La Garita Wilderness on the north and egcompasses an area of about 14,000 acres (about 21.8 mi²). It includes the land formerly designated the Wheeler National Monument, which is near the center of the study area within the subsequently designated Wheeler Geologic Area, and consists of about one-half square mile containing about 66 acres of deeply dissected tuff (see map A).

GEOLOGY

The study area is underlain entirely by volcanic rocks, mainly thick ash-flow-tuff deposits of Oligocene age, most of which were deposited within the huge La Garita caldera (fig. 2; Steven and Lipman, 1976). Two major faults crossing the area, trending generally west-northwest, may be part of the ring-fracture zone of the younger Bachelor caldera, which is nested in the western side of La Garita caldera. The eastern boundary of the Bachelor caldera, in the study area, is concealed.

Wason Park, which occupies the southwest one-third of the study area, is underlain by Wason Park Tuff (map A), which is composed of red, rhyolitic ash-flow tuff containing phenocrysts of tabular feldspar, platy biotite, and sparse augite and characteristic white, tridymitic, collapsed pumice fragments.

Silver Park, which occupies the southeastern one-third of the study area (map A), is underlain mainly by quartz latite and rhyolite lavas and breccias.

The northern one-third of the study area is underlain mainly by Fish Canyon Tuff, Rat Creek Tuff, and Nelson Mountain Tuff (map A). The surficial geology includes substantial areas of glacial drift and landslide debris.

The canyon of West Bellows Creek cuts through Wason Park Tuff, through the quartz latite and rhyolite that underlie Silver Park, and into various underlying units of volcanic rock not extensively exposed in the main part of the study area.

The former Wheeler National Monument, now within the Wheeler Geologic Area, consisted of about one-half square mile containing about 66 acres of deeply dissected outcrops of white, gray, and buff Rat Creek Tuff.

GEOPHYSICAL INTERPRETATION

According to Eaton (1977), the Bouguer gravity map of Plouff and Pakiser (1972) is not adequate for a mineral assessment because too few gravity stations were established in the area. An aeromagnetic map (U.S. Geological Survey, 1972), however, was prepared from a survey flown in 1968 at a barometric elevation of 14,500 ft and a flight-line spacing of 1 mi; it is sufficiently detailed to aid in assessing the mineral potential of the study area.

Contoured aeromagnetic data for most of the Wheeler Wilderness Study Area and part of the adjoining La Garita Wilderness are shown in map B. A broad magnetic anomaly in La Garita Wilderness is surmounted by two smaller highs that are about 650 gammas higher than the peak of the larger anomaly. One of the highs trends northeast across the Wheeler Geologic Area, and another trends northwest along the ridge in the northwest corner of the Wheeler Wilderness Study Area. The local, northeast-trending positive anomaly that crosses the Wheeler Geologic Area is believed to be related to a subsurface body the top of which is calculated to be about 1,000 ft or more below the surface. The elongate, northwest-trending high, which follows the Saguache-Mineral County line, is interpreted as an expression of the topographic ridge carved from the normally polarized, intercaldera La Garita Member of the Fish Canyon Tuff.

No evidence suggests that either magnetic anomaly has mineralization associated with it.

GEOCHEMISTRY

Zinc

Anomalous amounts of zinc (110-510 ppm) are present over a wide area in the drainage of West Bellows Creek. Four panned concentrates containing 400-510 ppm zinc suggest no coherent pattern that might indicate concealed ore deposits. Stream-sediment samples taken at the same sites contain significantly less zinc (see map C for sample localities).

According to T. A. Steven (oral commun., 1982), much of the zinc in the stream sediments is in volcanic magnetite. This was confirmed by analyses of magnetic concentrates for six samples containing anomalous zinc. The results are compared in table 1 for zinc contents of raw stream sediments, panned concentrates, and magnetic concentrates. Samples containing more than 100 ppm zinc are also listed in table 2. Inasmuch as the zinc is lodged in volcanic magnetite, there is low resource potential for zinc in the study area. Map D shows sample localities where anomalous amounts of metals were detected.

Uranium

Scintillometer readings taken in the study area range between 85 and 110 counts per second. Readings taken with the same instrument in other areas of Colorado are generally 40-60 counts per second. No areas of spuriously high radiation were detected by the scintillometer; but, rather, a consistently high background is characteristic.

Analytical data (ICP, induction-coupled plasma) show that in five samples uranium is slightly greater than the lower detection limit of the method. The range of uranium content is relatively high (as much as 50 ppm) and probably varies between 30 and 50 ppm.

Previous work done in the region by others (R. A. Zielinski, oral commun., 1982) suggests that uranium in volcanic glass in the rocks is commonly about 10-20 ppm. There is no evidence to suggest accumulations of uranium in amounts greater than 50 ppm.

The five anomalous samples and five other randomly selected samples were analyzed by delayed neutron activation; the results tabulated in table 3 indicate that uranium-thorium contents are not anomalous but are normal for these rocks. The lower limit of detection for the ICP method has been changed to 80 ppm (Crock and others, 1983).

Gold

Only one sample (stream-sediment sample 23) is shown to contain gold in amounts greater than the detection limit of 4 ppm, ICP method (table 2). That amount is only slightly above the detection limit and may not be reliable.

The absence of detectable gold in panned concentrates from the study area and, indeed, of any other detectable gold in samples from the study area, coupled with the absence of detectable silver in samples from the study area, suggest that the reported gold content is spurious and that concealed precious metals deposits in the study area are unlikely.

Tin

Traces of tin appear in six panned concentrates. Values range from 6-14 ppm (table 2).

The amounts of tin contained in the above-mentioned six samples are too small to be considered significant. Inasmuch as the six tin-bearing samples are panned concentrates, the tin mineral occurs as fine detrital grains or is incorporated in another heavy mineral such as magnetite. No detectable amounts of tin (>4 ppm) were found in stream-sediment samples taken at the same sample localities as the panned concentrates.

Zeolites

The rocks of the Rat Creek Tuff, which form the spectacular badlands outcrops in the Wheeler National Monument area, were studied by X-ray diffraction techniques for possible zeolite minerals reported by Steven and Bieniewski (1977, p. 11).

The zeolite mineral phillipsite has been tentatively identified in 4 of the 14 samples studied. Rough estimates, by X-ray diffraction, indicated a phillipsite content of 1-10 percent, much too low to be of commercial interest.

The major minerals in the Rat Creek Tuff collected for this study are volcanic glass, albite, quartz, unidentified clay minerals, and phillipsite.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The exposed rocks of the study area are entirely of volcanic origin, mainly ash-flow debris filling the subsiding La Garita caldera. The eastern part of the Bachelor caldera, nested within the western part of La Garita caldera, is included in the western part of the study area. The inferred ring-fracture zone of the eastern boundary of the Bachelor caldera may be expressed by west-northwest-trending faults in the study area. Possible veins related to that faulting could constitute hosts for mineral deposits, but evidence of such veins has not been found.

There are no indications of significant mineral deposits within the Wheeler Wilderness Study Area, and no mining claims or permits are known to have existed within it. Low-level anomalous concentrations of gold, uranium, and zinc were found in a few stream-sediment samples and panned concentrates, but the occurrences are randomly distributed, and there is little likelihood that they are related to concealed mineral deposits. A zeolite mineral (phillipsite?), which occurs in very small amounts in altered tuff, does not represent a resource commodity.

REFERENCES CITED

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Eaton, G. P., 1977, Geophysical interpretation, in Steven, T. A., and Bieniewski, C. L., Mineral resources of the La Garita Wilderness, San Juan Mountains, southwestern Colorado: U.S. Geological Survey Bulletin 1420, p. 37-40.

Plouff, Donald, and Pakiser, L. C., 1972, Gravity study of the San Juan Mountains, Colorado, in Geological Survey research 1972: U.S. Geological Survey Professional Paper 800-B, p. B183-B190.

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U.S. Geological Survey, 1972 [1973], Aeromagnetic map of the Ridgway-Paposa Springs area, southwestern Colorado: U.S. Geological Survey Geophysical Investigations Map GP-840, scale 1:250,000.

Table 1.--Comparison of zinc contents of stream-sediment, panned-concentrate, and magnetic-concentrate samples, Wheeler Wilderness Study Area

[Results in parts per million. Analyses by J. G. Crock. ICP, induction-coupled plasma; AAS, atomic-absorption spectroscopy]

Sample No.	Zinc in stream sediment (ICP)	Zinc in panned concentrate (ICP)	Zinc in magnetic concentrate (AAS)
4	88	280	1070
12	26	510	1330
17	73	500	1110
19	47	400	620
20	36	500	470
27	47	320	980

Table 2.--Table showing samples containing anomalous zinc, uranium, gold, and tin, Wheeler Wilderness Study Area

[All samples analyzed by induction-coupled-plasma spectrographic analysis by J. G. Crock. Sample types: SS, stream sediment; PC, panned concentrate]

Sample No.	Type	Parts per million
	Zinc[1]	
4B	PC	280
12B	PC	510
16B	PC	110
17B	PC	500
19B	PC	400
20B	PC	500
26B	PC	140
27B	PC	320
28B	PC	230
11	SS	200
34	SS	150
	Uranium[2]	
24	SS	40
26A	SS	40
32	SS	40
47	SS	50
51	SS	50
	Gold[3]	
23	SS	4
	Tin[4]	
12B	PC	10
17B	PC	8
19B	PC	12
20B	PC	14
27B	PC	9
28B	PC	6

[1]Detection limit 2 ppm.
[2]Detection limit 40 ppm.
[3]Detection limit 4 ppm.
[4]Detection limit 4 ppm.

Table 3.--Uranium analyses by delayed neutron activation (DNA) compared to induction-coupled-plasma (ICP) analyses of the same samples in parts per million

[ICP analyses by J. G. Crock; DNA analyses by Bruce Vaughn]

Sample No.	Uranium (ICP)	Uranium (DNA) U[1]	Uranium (DNA) Th[2]
W-22	<40	5	14
W-24	40	15	<6
W-26A	40	4	10
W-29	<40	5	13
W-30	<40	5	12
W-32	40	2	11
W-43	<40	5	14
W-44	<40	4	12
W-47	50	5	15
W-51	50	3	7

[1]Detection limit 0.5 ppm.
[2]Detection limit is a function of U/Th.

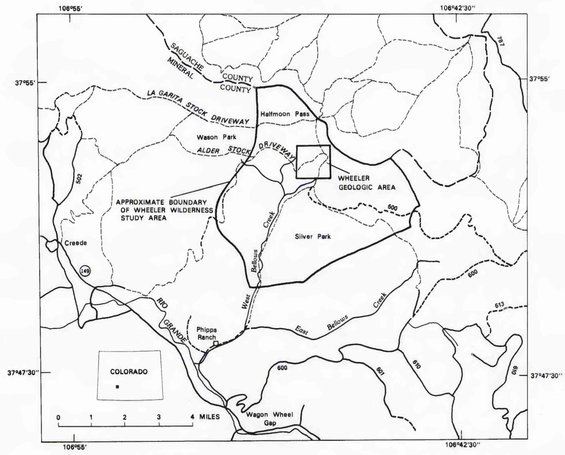

Figure 1.--Index map showing location of the Wheeler Wilderness Study Area, Mineral County, Colo.

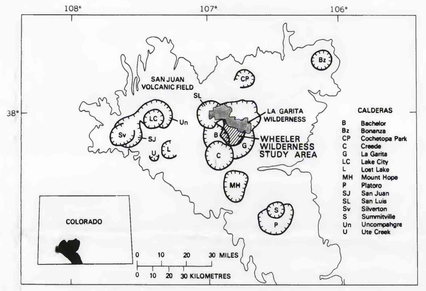

Figure 2.--Map showing location of the Wheeler Wilderness Study Area and La Garita Wilderness in relation to calderas in the San Juan volcanic field, southwestern Colorado (from Steven and Bieniewski, 1977, p. 3).

MAPS SHOWING GEOLOGY AND MINERAL RESOURCE POTENTIAL OF THE WHEELER WILDERNESS STUDY AREA, MINERAL COUNTY, COLORADO

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and
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